

JOURNAL OF THE BOMBAY NATURAL HISTORY SOCIETY

December 1991

Vol. 88

No. 3

NEW EVIDENCE FOR HYBRIDIZATION IN *PRESBYTIS JOHNNII* AND *PRESBYTIS ENTELLUS*¹

G. HOHMANN²
(With a plate)

The occurrence of langurs with an aberrant coat colour has been reported for different places in the Western Ghats, south India. Analyses of loud calls of a so-called 'brown langur' male revealed a similar physical structure to equivalent vocal patterns of both Nilgiri langur *Presbytis johnii* and common langur *P. entellus* = cxxxxxxxxcx : The timing of the phrases as well as the range and modulation of the basic frequency of the units resembles the loud call of *P. entellus*. The composition of the loud call bouts, consisting of several phrases with different vocal patterns and a specific expression movement during the performance, are characteristic features of loud call displays of *Presbytis johnii*. These findings support the hypothesis that the aberrant coloured langurs are hybrids of *Presbytis johnii* and *P. entellus*. Recent observations of the relationship between these species show various forms of interspecific associations. Males of both species join groups of the other species. The intruder can be a single male or (in one case) an all-male group. The relation can be affable, mutual tolerance or one-sided affinity. The absence of hybrids in a population for which long-standing association has been documented may indicate differences in behavioural strategies of these species.

INTRODUCTION

The Nilgiri langur *Presbytis johnii* is the only langur species endemic to India. Its distribution is restricted to natural forests in the southern part of the Western Ghats in south India (Kurup 1975, Oates 1979). In contrast to its closest relative, the purple face leaf monkey *Presbytis senex* of Sri Lanka, where several subspecies are distinguished (Napier and Napier 1967), the morphological character of the Nilgiri langur is homogeneous throughout the whole range of distribution. Trunk, tail and limbs are black, the head pilose is red to brown and wig-shaped.

However, Nilgiri langurs with a different coloration have been reported occasionally. The

first information of Nilgiri langurs with an atypical coat colour is contained in reports about skins collected for the British Museum (Anonymous 1955). More recently, Oates (1982) and Hohmann and Herzog (1985) observed so-called 'brown langurs' in the area of Agastiamalai and Anamalai respectively. In both cases, the brown individuals lived together with black coloured Nilgiri langurs, forming mixed groups.

The common characteristics of the brown animals of Anamalai (11 individuals in 3 different groups) were: Trunk and proximal parts of arms and legs brown. Tail, hands and feet, and the distal parts of the limbs were blackish in colour. All buff parts were black. The head pilose was cream coloured, hood-shaped, and closed below the lower jaw.

The occurrence of common langurs *Presbytis entellus* in adjacent ranges and the temporary

¹Accepted March 1988.

²Centre for Ecological Sciences, Indian Institute of Science, Bangalore 560 012

TABLE 1
PHYSICAL CHARACTERISTICS OF LOUD CALLS OF *Presbytis johnii*, *P. entellus*, AND A BROWN LANGUR MALE

	<i>Presbytis johnii</i>	Brown langur	<i>Presbytis entellus</i>
Number of units per phrase	7-18	2-9	2-6
Basic frequency, Hz	200-350	150-250	150-250
Frequency range, Hz	330-8000	150-5000	150-5000
Length of unit, sec.	0.25-0.5	0.2-0.5	0.5-0.5
Length of interval, sec.	0.1-1.25	0.1-1.5	0.2-1.8

Data for *Presbytis johnii* from Horwich (1976) and Herzog and Hohmann (1984). The data for *Presbytis entellus* are based on calls recorded from the Mundanthurai population and differ in some respects from data published by Vogel (1973) for langurs of north India.

association of a mature common langur (presumably a male) with one of the mixed groups led to the assumption that the brown langurs may be hybrids of *Presbytis johnii* and *P. entellus* (Hohmann and Herzog 1985). To confirm this assumption, based predominantly on morphological traits, more evidence was required. Since analyses of chromosomes or blood samples from brown animals were not feasible, further evidence on the behavioural level was looked for. Gautier and Gautier (1977) and Brockelmann (1978) found that species-specific vocal patterns of the parent species (*Hylobathes lar* and *H. pileatus* and *Cercopithecus ascanius* and *C. pogonias* respectively) were changed in the hybrid offspring.

Adult males of *Presbytis johnii* and *P. entellus* utter loud calls, commonly known as whoops or whoopings (Jay 1965, Poirier 1970). Although the units of these vocal patterns have a similar sound structure, the calls of both species are easy to distinguish by audition.

In the study reported here, sonagrams of loud calls of a male langur with the described coat colour aberration have been analysed and compared with loud calls of *Presbytis johnii* and *P. entellus*. More recent observations on interspecific relationship and interspecific association are described and possible mechanisms of limitation of hybridisation are discussed.

RESULTS

Although loud calls were emitted several times a day, only six complete whoop series of the brown langur male could be recorded and

analysed. According to the auditive impression, the recorded calls did not differ from other whoops heard from the same male. Sonagrams of initial phrases of *Presbytis johnii* and a brown coloured male and a whoop series of a male *Presbytis entellus* are shown in Plate 1. For physical parameters of the loud calls see Table 1.

Sound structure: All units of the first phrase (initial phrase) are tonal, with the energy distributed on narrow bands at low frequencies. Most units are two-phasic, starting with a relatively noisy inhalation phase (i-phase) with a lower amplitude followed by a tonal exhalation phase (e-phase) with a high amplitude. In the first and last units of a phrase, the i-phase may be absent. The whoop phrases of the brown male have an irregular time pattern. In all recorded units, the basic frequency remains rather stable and the range of modulation is small. Usually, the initial phrase is followed by another phrase, compiled only of noisy harsh barks (Plate 1).

Context: Whoops of the brown male were uttered in different situations. Like males of *Presbytis johnii* and *P. entellus*, the brown male regularly uttered the first series early in the morning (between 0530 and 0630 hrs) in unison with the first whooping bout of the Nilgiri langurs. These first series were comparatively longer (7 to 9 units) than series uttered later in the day. At the end of the first phrase of these morning calls, the male froze in a specific stop position (Horwich 1976). In all of the morning whoops heard, the initial phrase was followed by one or more harsh bark phrases. Besides these regular morning calls, dif-

ferent situations of unspecific disturbance could evoke whoop series at any time of the day. In those cases, the initial phrases were shorter and the described stop position or other specific postures were absent.

DISCUSSION

Loud calls of the type described above are notable for their discrete and stereotyped structure (Marler 1972). Despite some similarities of the whoop-units of *Presbytis entellus* with single units of an initial phrase of *P. johnii*, the calls of both species are characterized by distinctive features. The structure and composition of the loud call of the brown male shows partly an intermediate design compiled of elements of both *Presbytis johnii* and *P. entellus*.

The timing of the longer phrases of the brown male does not show the elaborate organization typical of the initial phrase of *Presbytis johnii*. The number of units per phrase is lower, but the intervals are longer than in whoops of Nilgiri langurs. Also, the shift of the basic frequency in the course of the phrase from lower to higher ranges and back which is typical for *P. johnii*, was never found in a phrase of the brown male. On the other hand, the stop position which marks the end of the initial phrase of the loud call of Nilgiri langurs was absent in common langurs but regularly occurred at the end of the brown male's morning whoop.

An even more important finding was the utterance of a second phrase (compiled of harsh barks) by the brown male because this is a feature of loud call bouts of *Presbytis johnii* but does not occur in loud calls of *P. entellus*. However, a similar bark is uttered by *entellus* males in situations of unspecific disturbances or during agonistic interactions between males (Hohmann in prep.). It is interesting to note that in loud calls of a sub-adult *johnii* male who started to utter this call (characteristic of adult leader males), the timing of the initially short phrases was similar to

that of the brown male. During the following three months, this male prolonged the phrases and developed the timing considerably (Hohmann in prep.). In the brown male, however, the length as well as timing of the phrases remained unaltered for almost one year (until the end of the study).

In addition to the morphological features and the interspecific association, the evaluation of the intermediate pattern of the loud calls of a brown langur male substantiates the assumption that the brown langurs are hybrids of *Presbytis johnii* and *P. entellus*.

During the recent field work in the area of Anamalai, no further clues for interspecific association were available. The brown individuals were confined to four groups and included juvenile, sub-adult and adult animals of both sexes.

Whereas various aspects of the interspecific relationship of *Presbytis entellus* and *P. senex* have been studied in detail (Hladik 1977, 1979), the relationship of Nilgiri langurs with common langurs in south India is still unknown. Along the eastern slopes of the southern part of the Western Ghats, the ranges of both species frequently overlap and interspecific interactions have been observed several times.

Of special interest is the situation in Mundanthurai (Agastyamalais), a place close to the area where brown langurs have been reported by Oates (1982). Here, a single Nilgiri langur male reportedly joined a group of common langurs for a longer period and mated with a female of this species (Chellam 1985). During the time of the study reported here (June 1986 to November 1987), the same group of common langurs was joined by an all-male group of five Nilgiri langurs. The interspecific relationship was characterized by dominance of the Nilgiri langurs who also initiated all contact attempts. Moreover, two other Nilgiri langur males were members of two heterosexual groups of the other species. Here, the interspecific relationship can be described as peaceful coexistence.

The best example of the close association of these Nilgiri langur males with their host groups

³ The data of Tanaka differ strikingly from the results of Poirier (1969) but are in accordance with the data for Nilgiri langurs of Mundanthurai (Hohmann in prep.).

was the regular performance of the whooping display early in the morning. Regularly, the Nilgiri langur males started with an elaborate whooping display, followed by the irregular whoop series of the common langur males. It is important to note that single Nilgiri langur males or males of all-male groups usually do not perform this display (Hohmann in prep.). Surprisingly, despite the long-standing association of these species, there is no recent evidence for hybrids in this population of common langurs.

Several mechanisms, preventing a successful copulation of a male Nilgiri langur with a female of the other species, are possible. One could be a lower *a priori* chance for a single *johnii* male. As known from various field studies, Nilgiri langurs live in groups with normally one adult male (mean sex ratio 1:8, Tanaka 1965)³. In contrast, groups of common langurs in the population mentioned above contained up to six matured males and frequently additional all-male groups were attached. Using the data published by Oppenheimer (1977), the mean sex ratio for common langurs is 1:4.2 (males of all-male groups not considered). Neglecting all losses and detriments of the intruder, the *a priori* chance of mating by an *entellus* male would be twice as high as that by a *johnii* male.

Moreover, behavioural mechanisms, like a higher copulation competition among females and a more efficient copulation timing in males of common langurs, may further reduce the chance of a Nilgiri langur male. On the other hand, the strategy of *entellus* females of choosing as consort not the group leader but a low-ranking male, or males from outside the group (Vogel 1975) may increase the chances for a *johnii* male.

Recently, some *entellus* males of the Mundanthurai population left their groups and settled higher in the mountains. Here, at the fringe of the rainforest, population density of Nilgiri langurs is high and the situation is now similar to that of Anamalai. It remains to be seen whether the common langur males can take advantage of the situation and associate with the other species.

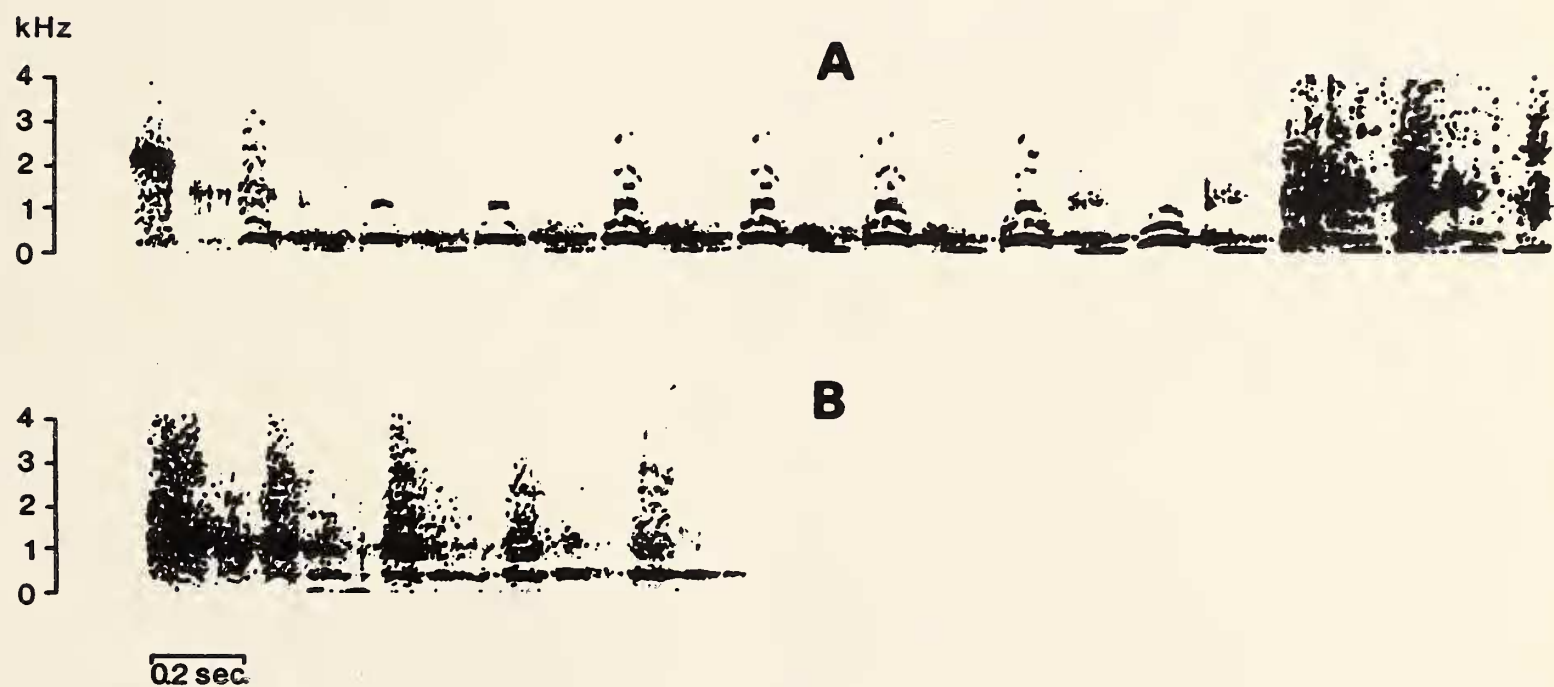
If that happens, another population with hybrid langurs may be expected. Further field studies are necessary to understand the mechanisms and strategies which regulate the relationship between these two species. Nevertheless, the design of the interspecific relationship between them as described above may not be a peculiarity of this special population only, but may reflect a more general trend in the relation between the two species.

As outlined by Waser (1987), competition between primate species can severely affect their distribution patterns. Hitherto, the restriction of Nilgiri langurs to forests at higher elevations only has been related mainly to factors like habitat destruction and poaching. The absence of the species in lower areas is certainly due to the lack of suitable habitat. However, in a survey of different areas of the Western Ghats it was found that the population of Nilgiri langurs in mixed or dry deciduous forests at lower altitudes (500 m or below) were similar to those in higher forests, provided the other species was absent (Hohmann and Wesley in prep.). On the other hand, some montane rainforest areas in the Western Ghats where Nilgiri langurs are absent are occupied by common langurs (Daniels, pers. comm; pers. obs.).

It seems that *Presbytis johnii* is not specialized to the small niche of rainforests but more flexible, and similar in its ecological adaptation to *P. senex*. Thus, it is assumed that the distribution pattern of Nilgiri langurs is not exclusively determined by factors like habitat destruction or poaching, but is also affected by interspecies competition with *Presbytis entellus*.

ACKNOWLEDGEMENTS

Financial support for the field work in India was provided by the Government of India (Ministry of Human Resource Development), the German Academic Exchange Programme and the National Geographic Society (grant 3353-86 to Prof D. Ploog). I am most grateful to the Chief Wildlife Warden, Mr. Venkatesan and Mr. Padmanabhan, for granting permission to do the field work. Spe-



Above: Initial phrases of *Presbytis johnii* (A) and a brown coloured male (B), and a whoop series of a male *P. entellus* (C).
 Below: Loud call phrases following the initial phrase (shown above) of *P. johnii* (A) and the brown male (B). In *P. johnii*, the phrase is compiled of noisy harsh barks and tonal units. The brown male utters only harsh barks.